BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: B.TECH **SEMESTER: 7th**
BRANCH: BIOTECH **SESSION: MO/2022**

SUBJECT: BE402 BIOREACTOR AND BIOPROCESS DESIGN

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

				CO	BL
Q1	(a)	With diagram describe the behavior of ANY ONE non-Newtonian fluid.	[2]	CO1	BL1
Q1	(b)	Prove that in a chemostat, at steady state and for sterile feed, $\mu = D$.	[3]	CO2	BL3
Q2	(a)	Name the components of a typical bioreactor (CSTR)	[2]	CO1	BL1
Q2	(b)	In an exponentially growing batch culture of *Saccharomyces cerevisiae*, the cell density is 20 g/L (DCW), the specific growth rate (μ) is 0.4 h^{-1} and substrate uptake rate is 16 g/L.h. Calculate the cell yield coefficient Yx/s.	[3]	CO2	BL3
Q3		It is desired to produce 100 kg fructose per day in a batch reactor by enzymatic reaction. Initial glucose concentration is 100 g/L. Conversion efficiency is 40%. If, $K_m = 5\times10^{-4}$ kg/m^3, $V_{max} = 1.5\times10^{-2}$ kg/m^3.sec. Down time is 6 h. Calculate the volume of the batch reactor, PFR and MFR.	[5]	CO2	BL5
Q4	(a)	Differentiate between packed bed and fluidized bed reactor.	[2]	CO2	BL2
Q4	(b)	Describe the gassing out methods of determination of K_La for aerobic fermentation.	[3]	CO1	BL3
Q5	(a)	Which reactor you will prefer when: i) Product inhibits the process; ii) Substrate inhibits the process	[2]	CO1	BL1
Q5	(b)	A fed batch culture is operating with intermittent addition of glucose solution. The values of following parameters are given at t = 2 hours. Considering the system is at quasi steady state, calculate V_0, S and X for the system. Given: V = 1000 mL; S_0 = 100 g/L; Ks = 0.1 g/L; X_0 = 30 g; F = 200 ml/h; μ_{max} = 0.3 h^{-1}; Yx/s = 0.5 g/g.	[3]	CO2	BL5

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